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On-line inferences.

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ON-LINE INFERENCES

A Thesis Presented

By

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To my mother and the memory of my father

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ABSTRACT

On-Line Inferences

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Text comprehension has long been assumed to involve on-line inferences; however, the evidence supporting this assumption is weak and open to other explanations. This thesis proposes that these inferences do occur, but only when context contains much precise information supporting inferences. Two norming studies were conducted to determine the predictability of target words in contexts. In two experiments, gaze durations were equal on target words that had either appeared earlier in a text or would have been easily inferred by readers actively processing that text. The target word received significantly shorter gaze durations in the above situations than in a situation in which it had not previously appeared in the text and could not have easily been inferred from the text. The same pattern was obtained with respect to first fixation duration. These results support an on-line inference model, and offer no support for an inference-at-test model. This study, together with that of O'Brien and Shank (1986), establishes a methodology for further investigation of the precise nature of inferences.

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INTRODUCTION

Text comprehension typically involves active participation on the part of the reader, who must expand upon and enrich information contained in the text. Frequently, inferences are added to the text base. Inferences are assumed to occur during reading and to be stored in memory with the text's explicit information (Kintsch, 1974; Kintsch and van Dijk, 1978; Rumelhart and Ortony, 1976; Schank, 1976). The evidence for on-line inferences is, however, weak at best and is open to alternative explanations. Since so many investigators assume that on-line inferences are important to reading comprehension, it is important to demonstrate their existence empirically.

A useful distinction among types of inferences is the forward-backward distinction. It may be helpful to discuss the results of selected studies dealing with backward inferences in order to see the difficulties involved in interpretation of inferencing studies. A backward inference is one that is necessary to maintain text coherence. Consider the following example, for instance: "Gretzky took a slap shot. The puck hit the back of the net." Although there is no surface overlap between the two sentences, sense is easily made from the sequence by inferring a relation between "puck" and "slap-shot" (in a backward direction). A

forward inference works in the opposite way: the reader extrapolates from the text in a forward direction. Such an inference is not necessary for text coherence. Consider the following: "Gretzky took a slap-shot." One can infer that Gretzky scored, or that the goalie made a save, or that Gretzky's shot was not on goal. Whichever of these inferences is made, it should be clear that it is made in the forward direction.

As previously stated, the results of backward inferencing studies are open to alternative explanations. A discussion of a few representative studies will illustrate this. First, consider a study by Haviland and Clark (1974). Subjects read either the first or the second pair of the following sentences:

1. John left the beer in the car. The beer was too warm to drink.
2. John left the picnic supplies in the car. The beer was too warm to drink.

Reading time on each sentence of each pair was measured. The second pair supposedly would take longer for subjects to read because it required an inference to make the passage coherent. This is indeed what was found: subjects took longer to read the final sentence of the second pair. The conclusion was that subjects inferred that 'picnic supplies' included 'beer'. There is however, another reason that reading time might increase. Perhaps subjects took longer because they failed to make the connection between 'picnic

supplies' and 'beer,' that is, perhaps subjects did not make the required inference. It is thus unclear whether subjects did indeed make inferences at all in Haviland and Clark's study.

An investigation by Singer and Ferreira (1983), in particular their third experiment, is taken as demonstrating that backward inferences are more reliably drawn than forward inferences. Subjects read eleven sentences which were of the following types: 2 allowed forward inferences, 4 allowed backward inferences, and 5 were fillers. Subjects then answered 8 questions about the 11 sentences in a timed response task. Responses were 218 msec faster to the questions related to backward inference sentences than were responses to questions related to forward inference sentences. Singer and Ferreira concluded that backward inferences are more reliably drawn than forward inferences. However, in contrast to their conclusions, it could be argued that subjects failed to make inferences altogether, or that they made inferences at the time of questioning. A possible alternative explanation is that subjects used a reconstructive process based on a search of memory. The passages contained more information supporting backward inferences than forward inferences, thus it could have been easier for subjects to make backward inferences just on the basis of having a greater amount of information.

Alternative arguments can also account for the results of an experiment by McKoon and Ratcliff (1980). They concluded from recognition data that the activation of a referent of an anaphor is evidence for inferencing. An example of their passages is found below:

S1: A burglar surveyed the garage set back from the street.
S2: Several milk bottles were piled at the curb.
S3: The banker and her husband were on vacation.
S4a: The burglar slipped away from the streetlamp. (641)
S4b: The criminal slipped away from the streetlamp. (730)
S4c: A cat slipped away from the streetlamp. (758)

Subjects read the first three sentences, then read 4a, 4b, or 4c. Next they were shown a probe word 'burglar' and had to indicate whether that word was in the passage. Response times in msec to the probe are shown in parentheses. Because subjects were faster to respond to the probe following 4b than following 4c, McKoon and Ratcliff concluded that subjects inferred 'criminal' was the referent for 'burglar'. But was an inference made? There are two other plausible explanations. First, 'criminal' in 4b could have primed the probe, since they are semantically related. Thus, 4b would be faster than 4c simply because of lexical priming. Another possibility is that there was backward integration in the passage containing 4b: when the subject saw the probe, he could have checked back to see whether it was consistent with the previous context. Because 'burglar' is more consistent with 'criminal' than with 'cat' the response to the probe after 4b could have been facilitated.

From the brief discussion above, it is apparent that there are difficulties in interpreting the results of backward inference studies.

Turning now to a discussion of forward inference investigations, there is little evidence that such inferences accompany reading. In a cued recall task, Corbett and Dosher (1978) found no evidence that subjects inferred highly probable implicit instruments. In a related study employing the Stroop paradigm, Dosher and Corbett (1982) found no evidence for even the activation of implicit instruments. Only when subjects were instructed to infer the instruments did they do so. Singer (1979) used a measure of whether subjects understood an instrument based on earlier context and found no evidence that instruments were inferred.

An important question to be asked at this point is, why should we go any further into investigating the occurrence of inferences, given the present evidence? Once again, as previously stated, several theories of reading comprehension assume the occurrence of inferences, so it is important to try to demonstrate the phenomenon. In addition, three points can be made in general about the present body of literature to illuminate the importance of further research. One is that the kinds of inferences required in some of these studies (especially the instrument inference studies) seem to be relatively trivial. For example, it is not

important to infer the instrument of "John swept the floor." It seems reasonable to assume that the interest and importance of a passage's ideas are critical to the issue of inferencing. Another point to be made is that some of these studies use measures open to strategic processes at retrieval, and it is thus difficult to interpret their results. Finally, assuming that context plays a role in inferencing, perhaps insufficient contexts were provided by the two-sentence passages used in most of the experiments cited.

These criticisms were addressed by O'Brien and Shank (1986) in two experiments. Their passages required the inferred instantiation of a category member where the category member was integral to comprehension. In the explicit condition, the target was explicitly mentioned early in the passage. In the implicit condition, the target was implicitly mentioned early in the passage, i.e. the target concept was described. Context was also manipulated in the experiments to steer the reader to infer the target (high context) or not to draw any particular inference at all (low context). Consider the following examples, for instance:

high context: Chris and Randy were sneaking through a haunted house, brushing away cobwebs as they went. Suddenly a [fat, hairy eight-legged insect] (spider) dropped on Randy's shoulder. He thought that the spider looked like a black widow.

low context: Chris and Randy were exploring a house in a new development. They were taking notice of all the room sizes when Randy spotted a [fat, hairy eight-legged insect] (spider) in the corner. He thought that the spider looked like a black widow.

Please note that the implicit condition is indicated with brackets while the explicit condition is indicated with parentheses.

Subjects in the explicit condition read 'spider-spider' while subjects in the implicit condition read 'fat, hairy, eight-legged insect-spider.' Gaze duration, the total time spent looking at the second mention of the target, was measured in the first experiment, while naming time on the target in isolation was measured in the second experiment. O'Brien and Shank addressed the previously mentioned criticisms of inferencing studies by (1) using an on-line measure (e.g. gaze duration) and a second measure not subject to strategic processes, (2) using longer passages than most previous investigators (3 and 4 sentences) and (3) attempting to make the target inferences important for comprehension. They hypothesized that if a reader infers and stores in memory a word which is not explicitly contained early in the text, and then that word is actually later encountered in the text, then the time spent on the word should be the same as when the reader has explicitly seen that word earlier in the text. In other words, storing an inference of a word should be equally as useful in a later encounter with the word as seeing the word itself.

In the first experiment, subjects read targets as fast in a high context-implicit (inference) condition as in a high context-explicit (no inference) condition. This was taken as evidence that subjects made on-line inferences in the high context-implicit condition. In addition, subjects read targets more slowly in the low context-implicit condition than in the low context-explicit condition, indicating that subjects failed to infer the target in the low context-implicit condition. In fact, gaze duration in the low context-explicit condition was virtually equal to those of both high context conditions. Only the low context-implicit condition was significantly different, indicating that subjects did not infer targets in that condition.

One alternative explanation of these results is that inferences were not made, but rather some kind of backward integration process occurred. It would have been easier to search back through memory to find information consistent with the target in the high context passages than in the low context passages. There would be little or no difference between the high context-explicit condition and the high context-implicit condition because the target is highly consistent with both. It is unlikely that the results of O'Brien and Shank's first experiment were due to backward integration because gaze durations in both high context

conditions equalled that in the low context explicit condition. This pattern would not occur if it is simply easier to fit the target into the high context than into the low context; the low context-explicit condition would be longer than both high context conditions if this were the case.

They conducted a second experiment to address two issues. First, even though the pattern of data shows that backward integration was unlikely in the first experiment, a measure not susceptible to strategic processes was deemed necessary to resolve the problem. Second, assuming inferences occurred, were they merely activated or were they stored in memory? This experiment differed from the first experiment in two ways. First, a sentence to force readers to reinstate the target was included just prior to the target (e.g. 'Chris asked Randy what had fallen on his shoulder' in the high context version of the above example). Second, the last sentence of each passage was omitted, and subjects had to name the target in isolation.

To address the issue of whether backward integration of the target was responsible for the results of the first experiment, naming time on the target was chosen as the dependent measure because it is less open to strategic processes than gaze duration (Schustack, Ehrlich, & Rayner; 1986) and lexical decision (Seidenberg, Tanenhaus, Leiman, & Bienkowski; 1982). Regarding the activation vs. storage

issue, if in the high context-implicit condition the target word is inferred, but is merely activated instead of stored in memory, then readers should take longer to reinstate and name the word in the high context-implicit condition than in the high context-explicit condition. For example, it would be more difficult to reinstate 'spider' if 'fat, hairy eight-legged insect' had been stored than if 'spider' had been stored. The inference's activation in the high context-implicit condition would have faded by the time the target was encountered. If however, the inference is stored in the high context-implicit condition, then the times to reinstate and name should equal those in the high context-explicit condition. In fact, this is what was found. The pattern of naming times obtained matched the pattern of gaze durations in the first experiment, giving further evidence that the target was indeed inferred and stored in the high context-implicit condition.

The purpose of the experiments described in this thesis was to extend O'Brien and Shank's results to other text conditions. Specifically, how hard must a reader be pushed by context to infer target words in passages? Do readers make inferences in somewhat more "natural" texts?

To investigate these issues, two preliminary norming studies and two experiments were conducted, building upon the design used by O'Brien and Shank. Two levels of Context

were employed: the High Context was intended to strongly lead readers to infer a target word while the Low Context was not intended to lead readers to make any particular inference. Further, two levels of Explicitness were used: Implicit passages did not mention the target word early in the passage, while Explicit passages did mention the target word.

Gaze duration on a target word was measured in 2 experiments. It was assumed that if a word had been inferred, it would thus receive a short gaze duration when it was actually encountered later in the text. If a reader has stored an inference of an implicit word, that stored proposition should be as useful in a later encounter of that word as in a case in which the reader has explicitly seen the word earlier. The on-line inference model is contrasted with an inference-at-test-model. This model predicts that a reader infers a concept only when a referential target word is actually encountered and a subsequent search for the referent fails. This inference process is time-consuming, and will be reflected in longer gaze durations on targets in conditions in which the word has not appeared previously than on targets in conditions in which the word has appeared previously.

C H A P T E R I I

NORMING STUDIES

In two preliminary studies, norms for the passages were collected to determine the predictability of the target words in potential experimental passages. Subjects were presented contexts up to the point where the target word appeared in each final sentence. Their task was to write the next word in the sentence, and to give confidence ratings for that word. Based on these norms, those passages judged to follow the expected pattern of correct target predictions were selected for use in the experiments to be described later in this thesis. It was expected that the targets would be highly predictable in the High Context Explicit condition because of the highly constraining context and because of the previous mention of the target word, and very predictable in the High Context Implicit condition due to the highly constraining context (although somewhat less predictable than in the High Context Explicit condition). Targets were expected to be somewhat predictable in the Low Context Explicit condition because of the presence of the target early in the passage, and were expected to be least predictable in the Low Context Implicit condition because in this condition there were few constraints on what the target could be.

METHOD

Subjects. Forty-eight students at the University of

Massachusetts participated for partial course credit in the first study, and 36 students participated for partial course credit in the second study.

Materials and Design. Two Context levels were employed: a High Context, in which the intent was to strongly lead readers to infer the target word that occurred near the end of each passage; and a Low Context, in which the intent was not to steer readers to any particular inference. In addition, two levels of Explicitness were employed: an Explicit condition, in which the target was mentioned early in the text; and an Implicit condition, in which the target was not mentioned early in the text. Four conditions thus resulted from the crossing of the 2 levels of each of the 2 factors: High Context Explicit, High Context Implicit, Low Context Explicit, and Low Context Implicit. Just prior to the sentence containing the target, each passage contained a sentence designed to force subjects to reinstate the target word (or to infer the target if subjects have not done so already). This sentence demanding reinstatement was identical across the 4 versions of a passage.

For the first norming study, 4 lists of 40 passages each were constructed to counterbalance the 4 conditions across the lists and ensure that no version of any passage appeared in any 2 lists. Only 22 passages met the criteria for target predictions and therefore were chosen to appear

in the experiments. A second norming study was conducted to obtain additional materials. Twelve passages from the original set were modified because they did not meet the above guidelines for number of correct predictions. Four lists of 12 passages were constructed to counterbalance the 4 conditions across the 4 lists and ensure that no version of any passage appeared in any 2 lists. The passages selected, accompanied by the number of correct predictions and mean ratings, appear in the Appendix. Examples of the passage where KNIFE is the target are found below (please note that brackets indicate the implicit words, parentheses indicate the explicit words, and that the underlined phrases did not appear in the lists):

HIGH CONTEXT EXPLICIT
Jenny was playing in the alley when she found a body with (a knife) sticking out of it. She looked closer and then ran home screaming to her mother, who immediately called the police. The police wanted to know what the instrument was. Through her tears, Jenny said that a knife was the weapon.

HIGH CONTEXT IMPLICIT
Jenny was playing in the alley when she found a body with [something] sticking out of it. She looked closer and then ran home screaming to her mother, who immediately called the police. The police wanted to know what the instrument was. Through her tears, Jenny said that a knife was the weapon.

LOW CONTEXT EXPLICIT
Jenny was playing in the alley when she found a body with (a knife) lying next to it. She looked closer and then ran home screaming to her mother, who immediately called the police. The police wanted to know what the instrument was. Through her tears, Jenny said that a knife was the weapon.

LOW CONTEXT IMPLICIT
Jenny was playing in the alley when she found a body with [something] lying next to it. She looked closer and then ran home screaming to her mother, who immediately called the police. The police wanted to know what the instrument was. Through her tears, Jenny said that a knife was the weapon.

Procedure. Each subject was presented a list in which each passage lacked the final phrase which began with the target word. Subjects were instructed to write the word that would appear next in the sentence. They were then required to rate how confident they were on a scale of 1 (not confident) to 5 (very confident) that the word they wrote would actually be the next word in the sentence. Each session lasted from 15 to 30 minutes.

Results

Mean confidence ratings, mean number correct predictions and probability of a correct prediction for each condition in the norming studies are presented in Table 1. Twenty-two passages from the first norming study followed the expected pattern of target word prediction and were selected for use in the later experiments. These 22 passages allowed high prediction in both of the High Context conditions, slightly less prediction in the Low Context Explicit condition, and much less prediction in the Low Context Implicit condition. It was decided to conduct a second norming study, in which 12 of the passages that failed to follow the expected pattern of predictions from the original set were modified in order to facilitate

correct prediction of the target words in both of the High Context conditions, slightly fewer correct predictions in the Low Context Explicit condition, and many fewer accurate predictions of the targets in the Low Context Implicit condition. From this study 6 passages which followed the expected pattern of predictions were selected. Thus, 28 passages were selected from the norms for use in the experiments.

Table 1. Summary of Target Predictions and Confidence Ratings in the Norming Studies

	# CORRECT	RATING	PROB.
HIGH CONTEXT EXPLICIT	9.8 (5-12)	4.6 (.6)	.86
HIGH CONTEXT IMPLICIT	9.5 (6-12)	4.4 (.7)	.84
LOW CONTEXT EXPLICIT	8.3 (1-12)	4.2 (.7)	.74
LOW CONTEXT IMPLICIT	3.5 (0-9)	3.6 (.9)	.30

Note: Ratings ranged from 1 (not confident) to 5 (very confident). The range in number of correct responses and standard deviations for the ratings are given in parentheses.

CHAPTER III

EXPERIMENT 1

Gaze duration on a target region was measured to explore whether a target word had been inferred from context. Gaze duration is defined as the total time fixating a word (excluding leaving the word and regressing back to it). Gaze duration is not taken to mean processing time, but rather is one of several useful and informative measures of processing. The focus in subsequent discussions will be on gaze duration on the target region, although other measures of processing reflected in eye movements will be examined, as well. Because it is unclear precisely what gaze duration measures, several other measures of processing were utilized to obtain concurring evidence. These measures were: first fixation duration (the time spent in an initial fixation on a word); fixation duration including only those trials in which there was exactly one fixation on the target word itself; N + 1 fixation duration (to examine any spillover effects of processing); and the percentage of targets fixated. It was assumed that if a word had been inferred, it would receive a shorter gaze when it was actually encountered later in the text than in a situation in which the word could not easily have been inferred. There is considerable evidence indicating that fixation duration and gaze duration are sensitive indices of processing difficulty based on context. First, words that

are predictable or constrained by context are fixated for shorter periods of time than are words not predictable or constrained by context (Ehrlich and Rayner, 1981; Zola, 1984). Second, grammatical category has been found to affect the length of fixation duration. Holmes and O'Regan (1981) and Rayner (1977) found evidence that the main verb in a simple declarative sentence is fixated longer than subject or object nouns. Third, frequent words are fixated for shorter periods than are infrequent words (Rayner, 1977; Inhoff, 1984; Just & Carpenter, 1980; Rayner & Duffy, 1986). Finally, Balota, Pollatsek, and Rayner (1985) found that both the predictability of a target and a visually related parafoveal preview of the target led to shorter gaze duration on the target. These kinds of evidence indicate that fixation duration and gaze duration reflect ease of processing of a particular word.

If inferences are made during the course of normal reading, then gaze duration on the target region should be shorter in the High Context Implicit passages than in the Low Context Implicit passages, simply due to greater ease and precision of inferencing in the high context conditions. More interestingly, gaze duration in the High Context Implicit condition should equal those in the High Context Explicit and Low Context Explicit conditions. If a reader has stored an inference of an implicit word, that stored

concept should be as useful in a later encounter with that word as in a case in which the reader has explicitly seen that word earlier. A second possibility would be that inferences are not made on-line, that is, they do not occur early in comprehension. In this case, an inference would be drawn only when the target word is encountered in the last sentence. If this were to happen, then the target would be expected to be read quickly in the High Context Explicit condition, a bit more slowly in the High Context Implicit and Low Context Explicit conditions, and most slowly in the Low Context Implicit condition. The target would be inferred in the High Context Implicit condition, but only when it is actually encountered. This inference process would take time, and therefore increase gaze duration on the target.

METHOD

Subjects. Twenty students at the University of Massachusetts participated for pay. All had normal uncorrected vision. Nineteen of the subjects had participated in at least one previous eyetracking study, and 1 was new to the procedure.

Materials and Apparatus. The 28 passages selected from the norming studies were used. Sixteen filler passages (two were warm-up passages at the beginning of the experiment and the remaining 14 were interspersed randomly with the experimental passages) were also written. The fillers were

included to discourage subjects from developing any particular strategy during reading. Four lists, each containing 28 experimental passages plus 16 fillers, were created. Each list contained 7 passages in each of the four conditions. The passages occurred in a random order in the lists, and no two lists contained the same version of any passage.

Subjects' eye movements were recorded with a Stanford Research Institute Dual Purkinje Eyetracker which was interfaced with a Hewlett-Packard 2100A computer. The position of a subject's right eye was sampled every msec and each 4 msec the average horizontal and vertical positions of the eye were compared to those of the prior 4 msec to determine if the eye was in a fixation or a saccade. The passages were presented on a Hewlett-Packard 1300A cathode ray tube (CRT). A bite bar was prepared for each subject at the start of the session; this stabilized the subject's head with the eyes 46cm from the CRT. Passages were presented in uppercase letters, with each letter being made up of dots from a 5 X 7 matrix, and three character spaces subtending 1 degree of visual angle. The passages extended 7 to 10 lines on the CRT, with up to 42 characters per line. A target word was never the first or last word in a line.

Procedure. After preparing the bite bar, the experimenter aligned the subject and calibrated the eye movement

recording system. The experimenter then briefly instructed the subject about the task. After reading and comprehending each passage, the subject pressed a key that resulted in the screen being cleared. Every few passages, the subject was asked a comprehension question about the passage just read. This manipulation was to ensure that the reader was attending to and comprehending the text. Between presentations of passages, there was a brief rest period during which the subject was encouraged to blink while the computer compiled the data for the passage just read. After the experiment, the subject was told the purpose and expected results of the experiment. Each session lasted from between 30 to 60 minutes.

Results

Approximately 20% of the trials were lost due to track losses. Scoring of the data went as follows: first, fixations on the target word were scored. If no fixations on the target had been made, then the fixation nearest to the target within a region 6 characters to the left of the target word was counted. If no fixation within this region to the left of the target had been made, then one within 3 characters to the right of the target word was counted. If a trial occurred in which no fixations within the target region were made, then the target was scored as having been skipped. In addition, a subject's data were discarded if any cell was found to have fewer than 3 observations of

first fixation duration. Subjects were assigned randomly to 1 of 4 lists. Preliminary analyses based on subject error variability were performed which treated the list variable as a separate factor. These analyses showed no effect of list and no interaction of list with any other variables ($p > .25$ for all tests), so all analyses were collapsed over list. Planned comparisons for the gaze duration and fixation duration measures contrasted the Low Context Implicit condition mean with the mean of the other 3 conditions combined. These planned comparisons addressed the key assertion in this thesis. If readers infer a target word in the High Context Implicit condition, they should have the same concept stored in this condition as they have stored in the 2 Explicit conditions (in which they have actually seen that word previously). This will be reflected in gaze duration on the target region, which would be expected to be equal in both the High Context conditions and the Low Context Explicit condition. The mean of the Low Context Implicit condition should be larger than the mean of the other 3 conditions combined because the inference has failed in that case. In the analyses that follow, it should be noted that analyses based on subject error variability will be denoted by $F1$, while those based on item error variability will be denoted by $F2$. In addition, standard deviations for each condition in all of the following tables

are given in parentheses.

Mean gaze durations on the target regions are presented in Table 2. Targets in Explicit passages received shorter gaze durations than those in Implicit passages. This difference is primarily due to the long gaze duration in the Low Context Implicit condition. Explicitness was significant vs. both subject and item error variability ($F1$ (1, 19) = 4.394, p = .05, MSe = 1881; $F2$ (1, 27) = 5.538, p < .05, MSe = 1881). The effect of Context was marginally significant ($F1$ (1, 19) = 3.295, p < .10, MSe = 1383) as was the interaction of Context X Explicitness ($F1$ (1, 19) = 3.988, p < .10, MSe = 1602). Neither of these marginally significant effects were supported when tested against item error variability (p > .10). Pairwise comparisons showed that gaze durations were no different among the 2 High Context conditions and the Low Context Explicit condition ($F1$ < 1). A planned comparison showed that targets required longer gaze durations in the Low Context Implicit condition than in the other 3 conditions combined ($F1$ (1, 19) = 8.317, p < .01, MSe = 17722; $F2$ (1, 27) = 4.539, p < .05, MSe = 48358).

Table 2. Mean Gaze Duration on Target Region (msec)

High Context Explicit	217 (32)
High Context Implicit	214 (41)
Low Context Explicit	210 (34)
Low Context Implicit	242 (42)

The mean first fixation durations on the target region are presented in Table 3. Targets in Implicit passages were read more slowly than those in which the targets had been read previously. This was due primarily to the longer fixation duration in the Low Context Implicit condition. Explicitness was significant when tested against both subject and item error variability ($F1$ (1, 19) = 4.799, p <.05, MSe = 1205; $F2$ (1, 27) = 5.362, p < .05, MSe = 2338). Pairwise comparisons showed no differences among the first 3 means in all cases, ($F1$ < 1). A planned comparison showed that first fixation duration in the Low Context Implicit condition was significantly longer than the mean first fixation duration of the other 3 conditions combined when tested against subject error variability ($F1$ (1, 19) = 8.608, p < .01, MSe = 11303) and differed marginally when tested against item error variability ($F2$ (1, 27) = 3.115, p < .10, MSe = 32744).

Table 3. Mean First Fixation Duration on Target Region (msec)

High Context Explicit	209 (29)
High Context Implicit	209 (38)
Low Context Explicit	209 (33)
Low Context Implicit	232 (33)

Another measure was obtained in addition to gaze duration and first fixation duration. This measure includes only those trials in which a single fixation on the target

itself occurred. Table 4 presents the mean durations obtained by this measure. The overall pattern of data closely followed those of gaze duration and first fixation duration. Targets in Explicit passages received slightly shorter fixations than those in Implicit passages. There was a marginally significant effect of Explicitness ($F1$ (1,19) = 3.416, $p < .10$, MSe = 1328). This was not reliable, however, when tested against item error variability ($p > .10$). Counting only those trials in which the target itself was fixated once, a planned comparison showed that the target was read more slowly in the Low Context Implicit condition than in the other 3 conditions. Fixation duration in the Low Context Implicit condition differed significantly fom the other 3 means combined ($F1$ (1, 19) = 5.900, $p < .05$, MSe = 11720), but only marginally so when tested against item error variability ($F2$ (1, 27) = 3.110, $p < .10$, MSe = 38417).

Table 4. Mean Fixation Duration on the Target (excl. trials fixated more than once) (msec)

High Context Explicit	213 (36)
High Context Implicit	218 (39)
Low Context Explicit	215 (42)
Low Context Implicit	235 (32)

Table 5 shows the mean durations on fixation N + 1, the fixation immediately after the target region. The N + 1 fixation analysis was performed to examine any spillover

effects of processing target words. This analysis showed that it was somewhat more difficult to integrate targets into Low Context passages than into High Context passages, but this effect was not reliable. These durations demonstrated a significant Context effect ($F1$ (1, 19) = 5.264, $p < .05$, MSe = 1773). This was not reflected when mean N + 1 fixation duration was tested against item error variance ($p > .10$).

Table 5. Mean N + 1 Fixation Duration (msec)

High Context Explicit	209 (30)
High Context Implicit	215 (36)
Low Context Explicit	229 (26)
Low Context Implicit	226 (43)

Table 6 shows the percentages of targets fixated. Targets in Implicit passages were fixated somewhat more often than were targets in Explicit passages, however, the effect of Explicitness was not reliable. The Explicitness effect was marginally significant when tested against subject error variability ($F1$ (1, 19) = 3.685, $p < .10$, MSe = 359). No effect of Explicitness was found when tested against item error variability ($p > .25$). Further, there was no higher percentage of fixations on targets in Low Context passages than in High Context passages ($p > .15$). A pairwise comparison demonstrated no difference in percentage of targets fixated in the two High Context conditions (p

> .10). Nor was there a difference in percentage of targets fixated in the two Low Context conditions ($p > .35$).

Table 6. Percentage of Targets Fixated

High Context Explicit	74.2 (21)
High Context Implicit	81.0 (13)
Low Context Explicit	80.0 (16)
Low Context Implicit	84.7 (20)

Discussion

Each passage used in this experiment contained a referential target noun in its final sentence. This target noun refers to either an earlier mention of itself (Explicit condition) or the noun's broad concept (Implicit condition). When confronted with the task of identifying the referent, readers might initiate one of the following processes. First, upon reaching the target noun in the final sentence, they might search backwards through memory for information consistent with the target noun and infer the referent at that point. Or second, readers could search for a literal match of target noun to referent. Models that discuss each of these possibilities will now be examined.

The first model alluded to earlier can be called the Inference-at-Test Model. This model proposes that inferences occur, but only at the point of testing; that is, only when the target word is actually encountered. This model would predict the following pattern of results. Upon encountering a referential target noun, readers attempt to

locate the referent for it. In both Explicit conditions, this is very easy to do because the target word is already in memory. It is more difficult to locate the referent in the High Context Implicit condition because no match exists between the target and the concept contained in the memory representation. If no match is found, then the referent may be inferred based on the reader's knowledge and on contextual information. This inferential process requires time and therefore will increase gaze duration in this condition. Upon encountering a target word in the Low Context Implicit condition, readers will also attempt to find a referent for the target. In this condition, the search for the referent is unsuccessful, and there is little relevant context to guide an inference. The inference will fail or be incorrect. Gaze duration on a target would be expected to be longest in this condition. Let us summarize the predictions of this model quickly. The shortest gaze durations would be found on targets in High Context Explicit and Low Context Explicit passages. Somewhat longer would be the gaze durations on targets in High Context Implicit passages. The longest gaze durations would be found on targets in the Low Context Implicit condition. The general pattern of results in the First Experiment do not support the Inference-at-Test Model.

The other model alluded to earlier in this discussion

is the On-Line Inference Model. This model assumes that inferences occur early in comprehension, and not upon encountering the target word. In both the High Context Explicit and Low Context Explicit conditions, the inference of a referent is unnecessary. The time to search for and locate an exact match of referent to target is virtually equal in the 2 cases, assuming no strong effect of Context. The crucial test condition for this model is the High Context Implicit condition. This model assumes that the concept stored early in the memory representation in the High Context Implicit condition is exactly the same concept as is stored in the High Context Explicit and Low Context Explicit conditions. If a reader has stored an inferred referent which is the same concept as a target, then that stored referent should be as useful in a later encounter of the target as in a case in which the reader has explicitly seen that referent before. A concept identical to the target is inferred and stored in a High Context Implicit passages representation. It will be thus equally easy to process a target in the 3 aforementioned conditions. This will be reflected in the gaze duration data. What about the other condition, the Low Context Implicit condition? In this case, it will also be necessary to make inferences. Because of the lack of guiding context, such inferences have a high chance of not being made, or of being made incorrectly. Thus, gaze durations in this condition are expected to be

long.

The pattern of data fits these predictions very well. There are no differences among the gaze durations on the target regions of the High Context Explicit, High Context Implicit, and Low Context Explicit conditions. Gaze durations on targets in the Low Context Implicit condition were significantly longer. This pattern indicates that readers infer certain specific concepts while comprehending texts in the High Context Implicit condition. While it is not clear exactly where in the reading of a passage an inference occurred, it can be concluded that the inference occurred somewhere before the target was encountered.

C H A P T E R I V

EXPERIMENT 2

Experiment 1 demonstrated that under very constrained conditions, readers infer concepts. However, it is unclear whether the demand on readers is essential for inferences to occur. If the demand were eliminated, would readers still make the desired inferences? In Experiment 2 this issue is addressed by deleting the demand sentence from each passage. Perhaps readers will not infer concepts unless pushed very hard to do so. If one takes the view that readers are somewhat lazy processors who do not infer during the reading task unless demanded to do so, then it would be expected that no inferences would occur in this experiment. The results would be expected to be in the following pattern: targets in Explicit passages would receive shorter gazes than those in Implicit passages. In Explicit passages, the referent is easily located in memory while in Implicit passages it is not. Because the referent is not located in either of the Implicit conditions, it must be inferred. There is more information in the High Context Implicit condition than in the Low Context Implicit condition to guide an inference, so it is likely that an inference would be more successful (and faster) in the former condition than in the latter.

An alternative view is that readers do infer concepts very early in the passages, and do not have to be pressed to

do so. A pattern identical to that obtained in the first experiment would support this view. Gaze duration on a target region would be longest in the Low Context Implicit condition because either inferences would not occur, or would be incorrect. Gaze durations in the other 3 conditions, the High Context Explicit, High Context Implicit, and Low Context Explicit conditions, would be expected to be equal if indeed target referents are inferred.

METHOD

Subjects. Twenty University of Massachusetts students participated for pay. All had good uncorrected vision, and none had participated in the first experiment. Eleven of these had never participated previously in an eyetracking study; 9 were experienced eyetracking subjects.

Materials and Apparatus. The materials were the same as in the first experiment, with two exceptions. First, the demand sentence was deleted from each passage. Second, occasionally the final sentence was altered slightly so that the discourse flowed smoothly. The alterations were of form, and not of meaning. This was necessary because when the demand sentence was deleted from certain passages, the final sentence drew attention to itself by not reading coherently. Examples of the passage in which KNIFE is the target word are found below (please note that brackets

indicate the implicit condition and parentheses indicate the explicit condition):

HIGH CONTEXT EXPLICIT
Jenny was playing in the alley when she found a body with (a knife) sticking out of it. She looked closer and then ran home screaming to her mother, who immediately called the police. When the police arrived, Jenny said that a knife was the weapon.

HIGH CONTEXT IMPLICIT
Jenny was playing in the alley when she found a body with [something] sticking out of it. She looked closer and then ran home screaming to her mother, who immediately called the police. When the police arrived, Jenny said that a knife was the weapon.

LOW CONTEXT EXPLICIT
Jenny was playing in the alley when she found a body with (a knife) lying next to it. She looked closer and then ran home screaming to her mother, who immediately called the police. When the police arrived, Jenny said that a knife was the weapon.

LOW CONTEXT IMPLICIT
Jenny was playing in the alley when she found a body with [something] lying next to it. She looked closer and then ran home screaming to her mother, who immediately called the police. When the police arrived, Jenny said that a knife was the weapon.

The apparatus was exactly the same as in the first experiment.

Procedure. The procedure was exactly the same as in the first experiment. Each experimental session lasted from 30 to 60 minutes.

Results

Approximately 20% of the trials were lost due to track losses. Data were scored exactly as in Experiment 1. Mean gaze durations are listed in Table 7. Targets in High Context passages received shorter gazes than those in Low

Context passages. The Context effect was significant vs. subject error variability ($F1$ (1, 19) = 7.058, $p < .05$, MSe = 969), but only marginally so vs. item error variability ($F2$ (1, 27) = 3.318, $p < .10$, MSe = 2344). Targets in Implicit passages received slightly shorter gazes than those in Explicit passages. The effect of Explicitness was significant vs. subject error variability ($F1$ (1, 19) = 9.315, $p < .01$, MSe = 1380); but only marginally so vs. item error variability ($F2$ (1, 27) = 3.911, $p < .10$, MSe = 4018). Pairwise comparisons showed no differences among the first 3 conditions in all cases, $p > .15$. A planned comparison showed that targets in Low Context Implicit passages received significantly longer gaze durations than those in the other 3 conditions, when tested against subject error variability ($F1$ (1, 19) = 7.736, $p < .05$, MSe = 13795); and when tested against item error variability ($F2$ (1, 27) = 6.322, $p < .05$, MSe = 19838).

Table 7. Mean Gaze Duration on Target Region (msec)

High Context Explicit	189 (27)
High Context Implicit	202 (34)
Low Context Explicit	197 (28)
Low Context Implicit	220 (36)

Table 8 lists first fixation duration means in the target region. Targets in High Context passages were fixated for slightly shorter durations than those in Low

Context passages ($F1$ (1, 19) = 4.111, $p < .10$, MSe = 1022). However, this effect was not reliable when tested against item error variance ($p > .10$). Targets in passages in which the target was explicitly mentioned received shorter fixations than those in which the target was not explicitly mentioned. The Explicitness effect was significant vs. subject error variability ($F1$ (1, 19) = 7.880, $p < .05$, MSe = 1009) and marginally significant vs. item error variability ($F2$ (1, 27) = 3.495, $p < .10$, MSe = 3303). Pairwise comparisons showed no differences among the first 3 conditions in all cases, $p > .25$. In addition, a planned comparison indicated that targets in the Low Context Implicit condition were fixated significantly longer than those in the other 3 conditions ($F1$ (1, 19) = 10.696, $p < .01$, MSe = 6537; $F2$ = 4.855, $p < .05$, MSe = 16906).

Table 8. Mean First Fixation Duration on Target Region (msec)

High Context Explicit	187 (24)
High Context Implicit	196 (32)
Low Context Explicit	192 (21)
Low Context Implicit	211 (24)

Table 9 presents mean fixation durations on the targets themselves, excluding trials on which there were multiple fixations. Targets in passages in which the target had previously been explicitly mentioned earlier received shorter fixations than those in passages in which the target

had not been mentioned previously. The effect of Explicitness was significant ($F1$ (1, 19) = 6.708, $p < .05$, MSe = 3012; $F2$ (1, 19) = 5.051, $p < .05$, MSe = 4348). Pairwise comparisons showed no differences among the first 3 conditions in all cases, $p > .10$. A planned comparison showed that targets in the Low Context Implicit condition received significantly longer fixations than those in the other 3 conditions ($F1$ (1, 19) = 5.538, $p < .05$, MSe = 25208; $F2$ (1, 27) = 3.544, $p < .10$, MSe = 29781).

Table 9. Mean Fixation Duration on the Target (excl. trials with multiple fixations) (msec)

High Context Explicit	185 (31)
High Context Implicit	202 (38)
Low Context Explicit	193 (27)
Low Context Implicit	221 (48)

Table 10 presents mean durations on the N + 1 fixations. There were no differences among these means when tested against subject or item error variability ($p > .25$).

Table 10. Mean N + 1 Fixation Duration (msec)

High Context Explicit	201 (32)
High Context Implicit	205 (48)
Low Context Explicit	201 (38)
Low Context Implicit	204 (27)

Table 11 presents the percentages of targets fixated. Targets were slightly less likely to be fixated in Low Context passages than in High Context passages. Context was

significant vs. subject error variability ($F1$ (1, 19) = 5.058, $p < .05$, MSe = 382) but not vs. item error variability ($p > .10$). Targets were less likely to be fixated in Low Context Implicit passages than in the other conditions. The Context X Explicitness interaction was significant vs. subject error variability ($F1$ (1, 19) = 7.720, $p < .05$, MSe = 261) but was unreliable when tested against item error variability ($p > .15$).

Table 11. Percentage of Targets Fixated

High Context Explicit	76.9 (17)
High Context Implicit	87.1 (17)
Low Context Explicit	79.9 (13)
Low Context Implicit	70.1 (16)

Because the patterns of first fixation durations and gaze durations were so similar over experiments, it was decided to combine the data from Experiments 1 and 2, treating Experiment as a between subjects variable. Gaze durations were longer over all conditions in Experiment 1, $F1$ (1, 38) = 7.194; $p < .05$, MSe = 1913; $F2$ (1,54) = 16.698, $p = .00$, MSe = 1617. First fixation durations were also longer in Experiment 1, $F1$ (1,38) = 9.632, $p < .01$, MSe = 1396; $F2$ (1,54) = 17.697, $p < .001$, MSe = 1379. Trials in which there was only one fixation directly on the target also were longer in Experiment 1, $F1$ (1, 38) = 8.559, $p < .01$, MSe = 1839; $F2$ (1, 54) = 21.384, $p = .00$, MSe = 5723. Additional planned comparisons demonstrated that there was a

strong difference between the mean of the Low Context Implicit condition and the mean of the other 3 conditions combined across experiments. This occurred in the first fixation duration analysis ($F1$ (1, 38) = 18.612, p = .001), in the gaze duration analysis ($F1$ (1, 38) = 16.022, p = .001), and in an analysis counting only those trials in which single fixations fell directly on the target itself ($F1$ (1, 38) = 10.975, p < .01, MSe = 18464). This was very stable across experiments, with no interaction of Experiment with any of the contrasts ($F1$ < 1). When the percentage of targets fixated data were pooled, the following results were obtained. Due to the inexplicably low percentage of fixations on the target in the Low Context Implicit condition in Experiment 2, there was a significant Context X Explicitness interaction, $F1$ (1, 38) = 4.824, p < .05, MSe = 1019. This also caused a significant Experiment X Context interaction, $F1$ (1, 38) = 6.147, p < .05, MSe = 891, and a marginally significant Experiment X Context X Explicitness interaction, $F1$ (1, 38) =3.184, p < .10, MSe = 1019. A pairwise comparison showed that targets in High Context Explicit passages were fixated less often than those in High Context Implicit passages over experiments, $F1$ (1, 38) = 6.461, p < .05, MSe = 447.

Discussion

The data again support the On-Line Inference Model, and

provide no support for the Inference-at-Test Model. The pattern of data obtained closely follows that found in the First Experiment. Further, it appears that in the High Context Explicit, High Context Implicit, and Low Context Explicit conditions, the same concept is stored early in the reading of the passages. The inference of a word does not occur simply because (and when) a passage demands it. These results indicate that the inferences that occurred in Experiment 1 did not occur merely because of the presence of the demand sentence. When a referential target word is encountered in the reading task, a reader must initiate a search for the referent of that target. These results indicate that in the 3 aforementioned conditions, a reader searches the memory representation and finds an exact match between target and referent. There is an exact match because that concept has been inferred early in the High Context Implicit passage, and because the word has already been read in both Explicit conditions.

Targets were actually fixated significantly more often in the High Context Implicit condition than in the High Context Explicit condition. One possibility is that in the former condition, there is somewhat more efficient parafoveal processing of the target than in the latter condition. Perhaps readers were able to extract more information about the upcoming target word when the word had explicitly appeared previously in informative context than

when it had not appeared in informative context. Another possibility is that correct inferences did not occur in every High Context Implicit passage, and so the correct concept was not always stored in memory. If an incorrect concept had been stored in memory, then parafoveal processing of the target could indicate that something was amiss, and incline the reader to fixate the target to make adjustments in processing. Of course, in the High Context Explicit condition, the correct concept should have been stored in all cases.

It has been assumed throughout this thesis that inferences do not occur or are incorrect in the Low Context Implicit condition. It is quite possible, however, that correct inferences occur in this condition. They could occur upon reaching the referential target noun. The context is not particularly informative in this condition nor is there an early instance of the target item. Readers have little motivation to infer the necessary concept. Upon reaching the target noun, an unsuccessful search for the referent is initiated. It could be that at this point the referent is inferred, and this might explain the long first fixation and gaze durations in this condition. The results in the Low Context Implicit condition could fit the Inference-at-Test Model. These experiments are unable to address this possibility.

There are 2 possible reasons why gaze durations were approximately 20 msec shorter in Experiment 2 as compared to those in Experiment 1. The pool of subjects may have changed between the two experiments. There were more experienced eyetracking subjects in Experiment 1, and Experiment 2 was conducted at the end of a semester. A more interesting explanation is that the difference in reading times was a consequence of the difference between the materials in the 2 experiments. The passages in Experiment 1 contained a demand sentence intended to do one of 2 things. These were either to 1) press readers to infer the target item at that point if they had not already done so, or 2) reinstate the referent of the target (already inferred or explicitly read). The nature of the reading and comprehension task in Experiment 1 was such that it demanded more work of readers. Perhaps the task demand caused readers to work harder to integrate the target word into a passage in Experiment 1 than in Experiment 2. This is supported by the marginally significant effect of Context upon the N + 1 fixation duration data in Experiment 1. Duration on the N + 1 fixation was shorter for targets in High Context passages than in Low Context passages. If the demand characteristic sentence caused readers to reinstate the referent, it makes sense that the informative context in the High Context passages made integration easier than did the imprecise information in the Low Context passages.

Still there would be an advantage of Experiment 1 because, regardless of the amount of information in a context, readers may be working harder in Experiment 1.

C H A P T E R V

GENERAL DISCUSSION

In two experiments, a word that had either appeared earlier in the text or would have been inferred easily by readers actively processing that text received equal gaze durations in each case. The word received considerably shorter gaze durations in the above situations than in the situation in which it had not previously appeared in the text and could not have been easily inferred from the text. The same pattern was obtained with respect to first fixation duration. These results are most consistent with an on-line inference model, and do not support an inference-at-test model. The on-line inference model assumes that when a reader encounters a referential target noun in the final sentence of a passage, she or he initiates a search to locate the referent of that noun. A referent has been stored in memory after it either has been inferred or has been read previously in the text. In the two conditions in which the word has previously been mentioned, the word itself has been stored and therefore it is easy to locate the referent. It is also easy to locate the referent in the condition in which the word has not been mentioned but there is much specific, informative context. In this condition, the concept has been inferred and stored.

The On-Line Inference Model specifically assumes that the stored inference of a word will be as useful in

processing of a later encounter of that word as will be the stored word itself. A particular concept is inferred and stored into the memory representation when there is sufficient informative context. The concept is identical to the target word in the final sentence of a passage. There are situations in which no inference is necessary: these are the conditions in which the particular item is explicitly mentioned earlier in the contexts. In these conditions, this same item is stored in memory.

Corbett and Dosher (1978) and McKoon and Ratcliff (1980) distinguish between the activation and the encoding of an inference. An inference can be passively activated or primed, yet never be encoded or integrated into memory. The On-Line Inference model assumes that the inferred concept has not only been activated, but has been integrated into the text representation. This study does not directly investigate whether inferences are merely activated or are encoded. It is, however, extremely unlikely that inferences were made and not stored in this study. It is difficult to imagine that an inference's activation would last long enough to have an effect on first fixation duration and gaze duration on the target word in the final sentence of a passage. The time course of activation is not infinite. In fact, Carroll and Slowiaczek (1986) found that activation lasts no further than a clausal boundary. This evidence

leads one to the strong conclusion that inferences were activated and stored early in the passages used in this study.

There are several important implications of the present results. Although theorists such as Kintsch and van Dijk (1978) and Schank (1976) have argued strongly that inferential processes are integral to reading, and that inferences become part of the text representation, the evidence is limited and often indirect. Some direct evidence was found by O'Brien and Shank (1986). They demonstrated that concepts are inferred and stored in the text representation. While O'Brien and Shank's study clearly demonstrated that inferences occur on-line under certain circumstances, their passages were in some ways highly artificial. In order to encourage inferences in the implicit conditions, they combined numerous specific adjectives or redundant clauses which complicated the texts abnormally. The present experiments employed more naturalistic passages in which the Implicit referent manipulation did not draw attention to itself. In addition, these experiments examined whether readers infer concepts only on demand, or as a natural part of reading.

The results of Experiment 2 showed that inferences apparently occur fairly early in the passages without strong signals to readers. Although the experiments did not locate exactly where the inferences occurred, it is clear in

Experiment 2 that the inferences did not occur only as a consequence of the task demand. Further, the overall patterns of gaze duration and fixation duration data were virtually identical over experiments, suggesting that the same inference effect was elicited by both experiments.

Although it is important to establish that inferences occur and are integrated during reading, the result is not surprising. Perhaps more importantly, this study, together with that of O'Brien and Shank, establishes a methodology for future examination of inferences. A number of researchers (e.g. Cairns, et al., 1981; Keenan, et al., 1984; and O'Brien & Myers, 1985) have accounted for effects of text manipulations upon memory by assuming inferences which provide additional retrieval routes. The exact nature of these inferential processes is unclear. In particular, this methodology could be used to specify the conditions under which inferences occur, the nature of the inferences themselves, and relating these to subsequent responses to probes of memory for text. In turn, the relations between inferential processes and memory for text should be clarified. This method will permit further identification of these inferential processes.

APPENDIX

Note: Version a. = High Explicit; b. = High Implicit; c. = Low Explicit; and d. = Low Implicit.

1. WINTER

a. Freddie had waited anxiously for the [winter to come]. He loved outdoor activities. He could build an igloo and a fort but best of all he could go sledding. This was his favorite time of year. He was happiest in the winter when there was snow on the ground. (5, 4.60)

b. Freddie had waited anxiously for the (season to change). He loved outdoor activities. He could build an igloo and a fort but best of all he could go sledding. This was his favorite time of year. He was happiest in the winter when there was snow on the ground. (12, 4.92)

c. Freddie had waited anxiously for the [winter to come]. He loved outdoor activities. Sometimes he would play outside with his friends or ride his horse. This was his favorite time of year. He was happiest in the winter when there was snow on the ground. (9, 4.67)

d. Freddie had waited anxiously for the (season to change). He loved outdoor activities. Sometimes he would play outside with his friends or ride his horse. This was his favorite time of year. He was happiest in the winter when there was snow on the ground. (0, NR)

2. SPIDER

a. Chris and Randy weren't afraid of [spiders]. Even so, Chris felt strange as they sneaked through the haunted house. Brushing away cobwebs as they went, they explored all the spooky rooms. Suddenly something dropped on Chris' shoulder. He looked to see what it was. It was a spider which had fallen from the chandelier. (12, 3.83)

b. Chris and Randy weren't afraid of (insects). Even so, Chris felt strange as they sneaked through the haunted house. Brushing away cobwebs as they went, they explored all the spooky rooms. Suddenly something dropped on Chris' shoulder. He looked to see what it was. It was a spider which had fallen from the chandelier. (11, 4.45)

c. Chris and Randy weren't afraid of [spiders]. Even so, Chris felt strange as they walked around the empty house. Walking slowly through the house, they explored each of the empty rooms. Suddenly something touched Chris' shoulder. He looked to see what it was. It was a spider which had fallen from the chandelier. (6, 4.00)

d. Chris and Randy weren't afraid of (insects). Even so, Chris felt strange as they walked around the empty house. Walking slowly through the house, they explored each of the empty rooms. Suddenly something touched Chris' shoulder. He looked to see what it was. It was a spider which had fallen from the chandelier. (8, 3.71)

3. CAMEL

a. Peter always thought of [sand and camels] when he thought of Saudi Arabia. Now he was there on assignment. One evening as he sat out under the stars, he heard the sound of bells, as if on a slowly walking animal's ankles. He saw something slowly approaching on the horizon. He wondered what it was. It was a camel with bells around its ankles. (10, 4.40)

b. Peter always thought of (sand dunes) when he thought of Saudi Arabia. Now he was there on assignment. One evening as he sat out under the stars, he heard the sound of bells, as if on a slowly walking animal's ankles. He saw something slowly approaching on the horizon. He wondered what it was. It was a camel with bells around its ankles. (10, 4.50)

c. Peter always thought of [sand and camels] when he thought of Saudi Arabia. Now he was there on assignment. One evening as he sat out under the stars, he began to hear some soft peculiar noises off in the distance. He saw something slowly approaching on the horizon. He wondered what it was. It was a camel with bells around its ankles. (11, 3.91)

d. Peter always thought of (sand dunes) when he thought of Saudi Arabia. Now he was there on assignment. One evening as he sat out under the stars, he began to hear some soft peculiar noises off in the distance. He saw something slowly approaching on the horizon. He wondered what it was. It was a camel with bells around its ankles. (9, 3.78)

4. ACROBAT

a. Little Alex watched [a group of acrobats] appear in the center ring. They did somersaults and cartwheels, and gracefully walked on their hands. He enjoyed their antics and happily applauded when they finished. This was his favorite circus act. He would like to be an acrobat when he grew up. (10, 4.80)

b. Little Alex watched [the next performers] appear in the center ring. They did somersaults and cartwheels, and gracefully walked on their hands. He enjoyed their antics and happily applauded when they finished. This was his favorite circus act. He would like to be an acrobat when he grew up. (8, 4.12)

c. Little Alex watched [a group of acrobats] appear in the center ring. They did things he had never seen before with outstanding skill and grace. He enjoyed their antics and happily applauded when they finished. This was his favorite circus act. He would like to be an acrobat when he grew up. (12, 4.83)

d. Little Alex watched [the next performers] appear in the center ring. They did things he had never seen before with outstanding skill and grace. He enjoyed their antics and happily applauded when they finished. This was his favorite circus act. He would like to be an acrobat when he grew up. (8, 3.75)

5. ROD

a. Joey was very happy with the [fishing rod] he'd received for his birthday. He could hardly wait to go trout fishing with his dad next weekend. They would go into the mountains and have a great time together. It was exactly what he had wished for. He practiced using the new rod in his room. (10, 4.50)

b. Joey was very happy with the (big present) he'd received for his birthday. He could hardly wait to go trout fishing with his dad next weekend. They would go into the mountains and have a great time together. It was exactly what he had wished for. He practiced using the new rod in his room. (9, 4.54)

c. Joey was very happy with the [fishing rod] he'd received for his birthday. He could hardly wait to get outdoors with his dad next weekend. They would go into the mountains and have a great time together. It was exactly what he had wished for. He practiced using the new rod in his room. (10, 4.64)

d. Joey was very happy with the (big present) he'd received for his birthday. He could hardly wait to get outdoors with his dad next weekend. They would go into the mountains and have a great time together. It was exactly what he had wished for. He practiced using the new rod in his room. (2, 2.00)

6. ROACH

a. Puffton Village is widely known for its large [roach] problem. Despite this, Terri was able to almost eliminate the problem by keeping her apartment immaculately clean. Unfortunately she had some neighbors who were complete slobs. One day Terri confronted one of these dirty types. She told him what she had seen. Just yesterday morning, she found a roach in her sugar bowl. (12, 4.5)

b. Puffton Village is widely known for its large (pest) problem. Despite this, Terri was able to almost eliminate the problem by keeping her apartment immaculately clean. Unfortunately she had some neighbors who were complete slobs. One day Terri confronted one of these dirty types. She told him what she had seen. Just yesterday morning, she found a roach in her sugar bowl.
(10, 4.6)

c. Puffton Village is widely known for its large [roach] problem. Despite this, Terri really enjoyed living there because she had lots of friends there. Sometimes she got angry when it grew too loud or the washers were all broken. One day Terri spoke to one of her new neighbors. She told him what she had seen. Just yesterday morning, she found a roach in her sugar bowl.
(10, 3.90)

d. Puffton Village is widely known for its large (pest) problem. Despite this, Terri really enjoyed living there because she had lots of friends there. Sometimes she got angry when it grew too loud or the washers were all broken. One day Terri spoke to one of her new neighbors. She told him what she had seen. Just yesterday morning, she found a roach in her sugar bowl.
(8, 3.38)

7. ANTS
a. [Lots of ants] had joined Jill and Dave on their picnic. They were crawling all over the food, apparently attracted by the chocolate cake that Jill had prepared for dessert. The fried chicken had been carefully wrapped and was still safe. When Jill saw what was happening, she let out a cry. Dave turned and saw a bunch of ants devouring the cake.
(11, 4.82)

b. (Some visitors) had joined Jill and Dave on their picnic. They were crawling all over the food, apparently attracted by the chocolate cake that Jill had prepared for dessert. The fried chicken had been carefully wrapped and was still safe. When Jill saw what was happening, she let out a cry. Dave turned and saw a bunch of ants devouring the cake.
(11, 4.73)

c. [Lots of ants] had joined Jill and Dave on their picnic. They were just in time to eat with them. The chocolate cake that Jill had prepared for dessert was a particular hit. On the other hand, the fried chicken had hardly been touched yet. When Jill saw what was happening, she let out a cry. Dave turned and saw a bunch of ants devouring the cake.
(11, 4.73)

d. (Some visitors) had joined Jill and Dave on their picnic. They were just in time to eat with them. The chocolate cake that Jill had prepared for dessert was a particular hit. On the other hand, the fried chicken had hardly been touched yet. When Jill saw what was happening, she let out a cry. Dave turned and saw a bunch of ants devouring the cake. (4, 4.25)

8. RATS

a. As a building inspector, Robin had seen many [rats] but they rarely bothered her. The basement of this particular house was the most disgustingly filthy one she had ever seen. Smelly garbage was everywhere. She was trying to decide what to write in her report when she heard something scurrying by some rotting food. Right away she knew what it was. The sound of the rats made her uneasy. (11, 4.54)

b. As a building inspector, Robin had seen many (things) but they rarely bothered her. The basement of this particular house was the most disgustingly filthy one she had ever seen. Smelly garbage was everywhere. She was trying to decide what to write in her report when she heard something scurrying by some rotting food. Right away she knew what it was. The sound of the rats made her uneasy. (9, 4.56)

c. As a building inspector, Robin had seen many [rats] but they rarely bothered her. This particular house was not in bad shape, although it was rather dusty from disuse. There were some old dirty clothes piled in a corner. She was trying to decide what to write in her report when she heard a noise somewhere in the room. Right away she knew what it was. The sound of the rats made her uneasy. (10, 4.20)

d. As a building inspector, Robin had seen many (things) but they rarely bothered her. This particular house was not in bad shape, although it was rather dusty from disuse. There were some old dirty clothes piled in a corner. She was trying to decide what to write in her report when she heard a noise somewhere in the room. Right away she knew what it was. The sound of the rats made her uneasy. (4, 1.67)

9. VODKA

a. Pat stocked her bar with drinks such as [juice, beer, and vodka]. All her friends were over for a party. Someone asked Pat for a screwdriver to drink. She found orange juice in the refrigerator, but forgot what the other ingredient was. What was it? she asked herself. Then she remembered that vodka was what she needed. (12, 4.83)

b. Pat stocked her bar with drinks such as (juice and beer). All her friends were over for a party. Someone asked Pat for a screwdriver to drink. She found orange juice in the refrigerator, but forgot what the other ingredient was. What was it? she asked herself. Then she remembered that vodka was what she needed. (11, 4.45)

c. Pat stocked her bar with drinks such as [juice, beer, and vodka]. All her friends were over for a party. Someone asked Pat for something to drink. She got orange juice from the refrigerator, but forgot what she was preparing. What was it? she asked herself. Then she remembered that vodka was what she needed.
(3, 2.33)

d. Pat stocked her bar with drinks such as [juice, beer, and vodka]. All her friends were over for a party. Someone asked Pat for something to drink. She got orange juice from the refrigerator, but forgot what she was preparing. What was it? she asked herself. Then she remembered that vodka was what she needed. (0, NR)

10. ROSES
a. Nancy was fond of receiving [roses] and other romantic things. Her husband Jerry was always giving her love notes and flowers. One day Nancy received a long box from the florist. She knew right away what was in the box. She thought the roses were absolutely beautiful. (11, 4.54)

b. Nancy was fond of receiving (flowers) and other romantic things. Her husband Jerry was always giving her love notes and flowers. One day Nancy received a long box from the florist. She knew right away what was in the box. She thought the roses were absolutely beautiful. (9, 4.56)

c. Nancy was fond of receiving [roses] and other romantic things. Her husband Jerry was always giving her love notes and jewelry. One day Nancy received a wrapped gift box at work. She knew right away what was in the box. She thought the roses were absolutely beautiful. (1, 3.00)

d. Nancy was fond of receiving (flowers) and other romantic things. Her husband Jerry was always giving her love notes and jewelry. One day Nancy received a wrapped gift box at work. She knew right away what was in the box. She thought the roses were absolutely beautiful. (0, NR)

11. COFFEE
a. [Drinking coffee] and staying up late were necessary evils for Frank. It was finals time and he was in big trouble. He hadn't attended class or opened a book in two months. He really needed something to drink to help him stay alert. He knew what he needed. A lot of coffee would do the trick. (9, 4.30)

b. (Endless worrying) and staying up late were necessary evils for Frank. It was finals time and he was in big trouble. He hadn't attended class or opened a book in two months. He really needed something to drink to help him stay alert. He knew what he needed. A lot of coffee would do the trick. (11, 4.73)

c. [Drinking coffee] and staying up late were necessary evils for Frank. It was finals time and he was in big trouble. He hadn't done any strenuous physical activity in a long time. He was tired and had absolutely no energy to do things. He knew what he needed. A lot of coffee would do the trick. (1, 4.00)

d. (Endless worrying) and staying up late were necessary evils for Frank. It was finals time and he was in big trouble. He hadn't done any strenuous physical activity in a long time. He was tired and had absolutely no energy to do things. He knew what he needed. A lot of coffee would do the trick. (0, NR)

12. KNIFE
a. Jenny was playing in the alley when she found a body with [a knife] sticking out of it. She looked closer and then ran home screaming to her mother, who immediately called the police. The police wanted to know what the instrument was. Through her tears, Jenny said that a knife was the weapon. (11, 4.45)

b. Jenny was playing in the alley when she found a body with (something) sticking out of it. She looked closer and then ran home screaming to her mother, who immediately called the police. The police wanted to know what the instrument was. Through her tears, Jenny said that a knife was the weapon. (11, 4.27)

c. Jenny was playing in the alley when she found a body with [a knife] lying next to it. She looked closer and then ran home screaming to her mother, who immediately called the police. The police wanted to know what the instrument was. Through her tears, Jenny said that a knife was the weapon. (11, 4.54)

d. Jenny was playing in the alley when she found a body with (something) lying next to it. She looked closer and then ran home screaming to her mother, who immediately called the police. The police wanted to know what the instrument was. Through her tears, Jenny said that a knife was the weapon. (7, 3.75)

13. BLOOD

a. Laurel got sick just seeing [blood]. Nonetheless, she was determined to become a doctor. She was working on the emergency ward for her internship. Suddenly a woman was rushed in who had been slashed in a terrible fight. Laurel didn't like what she saw. Seeing all the blood made her feel ill. (12, 4.67)

b. Laurel got sick just seeing (injuries). Nonetheless, she was determined to become a doctor. She was working on the emergency ward for her internship. Suddenly a woman was rushed in who had been slashed in a terrible fight. Laurel didn't like what she saw. Seeing all the blood made her feel ill. (11, 4.54)

c. Laurel got sick just seeing [blood]. Nonetheless, she was determined to become a doctor. She was working on the emergency ward for her internship. Suddenly a woman was rushed in who had been hurt in a mud slide. Laurel didn't like what she saw. Seeing all the blood made her feel ill. (8, 4.00)

d. Laurel got sick just seeing (injuries). Nonetheless, she was determined to become a doctor. She was working on the emergency ward for her internship. Suddenly a woman was rushed in who had been hurt in a mud slide. Laurel didn't like what she saw. Seeing all the blood made her feel ill. (8, 3.75)

14. DIVORCE

a. Tom and Ruth discussed [divorce] after one year of marriage. They seemed to outsiders not to have many troubles, but actually they fought constantly over financial matters. They went to see a lawyer. She asked them what they wanted. They told her that a divorce was the only solution to their problems. (8, 3.88)

b. Tom and Ruth discussed (problems) after one year of marriage. They seemed to outsiders not to have many troubles, but actually they fought constantly over financial matters. They went to see a lawyer. She asked them what they wanted. They told her that a divorce was the only solution to their problems. (8, 3.00)

c. Tom and Ruth discussed [divorce] after one year of marriage. They seemed to outsiders not to have many troubles, but actually they had constant financial difficulties. They went to see an accountant. She asked them what they wanted. They told her that a divorce was the only solution to their problems. (5, 2.80)

d. Tom and Ruth discussed (problems) after one year of marriage. They seemed to outsiders not to have many troubles, but actually they had constant financial difficulties. They went to see an accountant. She asked them what they wanted. They told her that a divorce was the only solution to their problems. (0, NR)

15. HAMMER

a. Joanne looked at her [saw and hammer]. Now she had everything she needed to build a doghouse. She cut the wood and was ready to nail it together. She reached for what she'd need. She picked up the hammer and was ready. (10, 4.60)

b. Joanne looked at her (set of tools). Now she had everything she needed to build a doghouse. She cut the wood and was ready to nail it together. She reached for what she'd need. She picked up the hammer and was ready. (12, 4.58)

c. Joanne looked at her [saw and hammer]. Now she had everything she needed to build a doghouse. She cut the wood and thought about the design of the house. She reached for what she'd need. She picked up the hammer and was ready. (6, 3.17)

d. Joanne looked at her (set of tools). Now she had everything she needed to build a doghouse. She cut the wood and thought about the design of the house. She reached for what she'd need. She picked up the hammer and was ready. (6, 3.83)

16. BUTLER

a. The [butler] at the mansion gave Mary the gardener an uneasy feeling. The millionaire had been murdered, and detectives were questioning everyone. Mary knew she was innocent, and so were the chef and maids. That left only one other suspect among the staff members. Mary thought she knew who it was. She was sure that the butler did it. (11, 4.64)

b. The (attendant) at the mansion gave Mary the gardener an uneasy feeling. The millionaire had been murdered, and detectives were questioning everyone. Mary knew she was innocent, and so were the chef and maids. That left only one other suspect among the staff members. Mary thought she knew who it was. She was sure that the butler did it. (7, 4.00)

c. The [butler] at the mansion gave Mary the gardener an uneasy feeling. The millionaire had been murdered, and detectives were questioning everyone. Mary knew she was innocent, and so were the chef and maids. But there were plenty of other suspects among the staff. Mary thought she knew who it was. She was sure that the butler did it. (10, 4.09)

d. The (attendant) at the mansion gave Mary the gardener an uneasy feeling. The millionaire had been murdered, and detectives were questioning everyone. Mary knew she was innocent, and so were the chef and maids. But there were plenty of other suspects among the staff. Mary thought she knew who it was. She was sure that the butler did it. (3, 4.00)

17. WILL

a. After their father's death, Tim and Barbara searched for the missing [will]. Their father had acquired a lot of property over the years, and they were hoping that it had all been left to them. They searched frantically through his things. Tim called to Barbara. What had he found? He triumphantly presented the will to Barbara. (11, 4.82)

b. After their father's death, Tim and Barbara searched for the missing (document). Their father had acquired a lot of property over the years, and they were hoping that it had all been left to them. They searched frantically through his things. Tim called to Barbara. What had he found? He triumphantly presented the will to Barbara. (10, 4.90)

c. After their father's death, Tim and Barbara searched for the missing [will]. Their father had also hidden away money and jewels, and no one knew how much they were worth or where they were kept. They searched frantically through his things. Tim called to Barbara. What had he found? He triumphantly presented the will to Barbara. (10, 4.80)

d. After their father's death, Tim and Barbara searched for the missing (document). Their father had also hidden away money and jewels, and no one knew how much they were worth or where they were kept. They searched frantically through his things. Tim called to Barbara. What had he found? He triumphantly presented the will to Barbara. (6, 4.50)

18. DIAMOND

a. Joan was delighted when Jim gave her a ring with a [diamond] in it. He had asked her to marry him, and now they were officially engaged. She went to show her father. He asked what kind of gem it was. She excitedly told him that it was a diamond from her boyfriend. (11, 5.00)

b. Joan was delighted when Jim gave her a ring with a (large stone) in it. He had asked her to marry him, and now they were officially engaged. She went to show her father. He asked what kind of gem it was. She excitedly told him that it was a diamond from her boyfriend. (12, 4.08)

c. Joan was delighted when Jim gave her a ring with a [diamond] in it. He often bought her expensive and unusual gifts, and this was no exception. She went to show her father. He asked what kind of gem it was. She excitedly told him that it was a diamond from her boyfriend. (12, 4.83)

d. Joan was delighted when Jim gave her a ring with a (large stone) in it. He often bought her expensive and unusual gifts, and this was no exception. She went to show her father. He asked what kind of gem it was. She excitedly told him that it was a diamond from her boyfriend. (9, 3.20)

19. TOOTH

a. Janet had a [tooth] ache. She went to the dentist to see if he could give her some relief. Her whole mouth was in pain. He asked her what was hurting. She said that her tooth hurt so much that she felt like crying. (8, 4.62)

b. Janet had a (bad) ache. She went to the dentist to see if he could give her some relief. Her whole mouth was in pain. He asked her what was hurting. She said that her tooth hurt so much that she felt like crying. (6, 4.83)

c. Janet had a [tooth] ache. She went to the druggist to see if he could give her some relief. Her head really ached badly. He asked her what was hurting. She said that her tooth hurt so much that she felt like crying. (10, 4.70)

d. Janet had a (bad) ache. She went to the druggist to see if he could give her some relief. Her head really ached badly. He asked her what was hurting. She said that her tooth hurt so much that she felt like crying. (0, NR)

20. REPORTER
a. After the last Patriots' game, a [reporter] came up to Steve Grogan. He asked Grogan several questions and took notes throughout their conversation. After a while, he left. Coach Berry asked Grogan who he'd been talking to. Grogan replied that it was a reporter who had been obnoxious and nosy. (11, 4.91)

b. After the last Patriots' game, a (man) came up to Steve Grogan. He asked Grogan several questions and took notes throughout their conversation. After a while, he left. Coach Berry asked Grogan who he'd been talking to. Grogan replied that it was a reporter who had been obnoxious and nosy. (10, 4.60)

c. After the last Patriots' game, a [reporter] came up to Steve Grogan. He wanted to tell Grogan about what he thought should have happened during the game. After a while, he left. Coach Berry asked Grogan who he'd been talking to. Grogan replied that it was a reporter who had been obnoxious and nosy. (12, 4.92)

d. After the last Patriots' game, a (man) came up to Steve Grogan. He wanted to tell Grogan about what he thought should have happened during the game. After a while, he left. Coach Berry asked Grogan who he'd been talking to. Grogan replied that it was a reporter who had been obnoxious and nosy. (1, 4.00)

21. CAKE
a. Keith went to the bakery to buy [a cake]. It was his wife's birthday and he wanted to surprise her with something special. When he got home, she asked him what was in the box. He showed her the cake and gave her a kiss. (12, 4.67)

b. Keith went to the bakery to buy (something). It was his wife's birthday and he wanted to surprise her with something special. When he got home, she asked him what was in the box. He showed her the cake and gave her a kiss. (11, 4.54)

c. Keith went to the bakery to buy [a cake]. Because they were dieting, it had been a long time since they had eaten sweets. When he got home, she asked him what was in the box. He showed her the [cake] and gave her a kiss. (11, 4.82)

d. Keith went to the bakery to buy (something). Because they were dieting, it had been a long time since they had eaten sweets. When he got home, she asked him what was in the box. He showed her the [cake] and gave her a kiss. (4, 4.00)

22. DESK

a. Greg and Jane were shopping for [a desk]. Jane often had to bring work home from the office, so she needed someplace to store her papers and work. Greg pointed to a piece about 30 feet away. "How about that desk over there?" he asked. (6, 4.83)

b. Greg and Jane were shopping for (furniture). Jane often had to bring work home from the office, so she needed someplace to store her papers and work. Greg pointed to a piece about 30 feet away. "How about that desk over there?" he asked. (9, 4.00)

c. Greg and Jane were shopping for [a desk]. They wanted one more piece to fill the empty spot in the room at the end of the upstairs hallway. Greg pointed to a piece about 30 feet away. "How about that desk over there?" he asked. (4, 4.60)

d. Greg and Jane were shopping for (furniture). They wanted one more piece to fill the empty spot in the room at the end of the upstairs hallway. Greg pointed to a piece about 30 feet away. "How about that desk over there?" he asked. (3, 3.00)

23. POPCORN

a. Don loved eating popcorn while he watched TV in the evening. While he was absorbed in a movie, Susan was in the kitchen. She got out the salt shaker and heated the oil as she melted the butter. When a commercial came on, he asked her what she was preparing. She said she was preparing popcorn because it was his favorite snack. (9, 4.78)

b. Don loved eating snacks while he watched TV in the evening. While he was absorbed in a movie, Susan was in the kitchen. She got out the salt shaker and heated the oil as she melted the butter. When a commercial came on, he asked her what she was preparing. She said she was preparing popcorn because it was his favorite snack. (9, 4.67)

c. Don loved eating popcorn while he watched TV in the evening. While he was absorbed in a show, Susan was in the kitchen. She searched the pantry for something both she and Don liked to eat. When a commercial came on, he asked her what she was preparing. She said she was preparing popcorn because it was his favorite snack. (9, 4.11)

d. Don loved eating snacks while he watched TV in the evening. While he was absorbed in a show, Susan was in the kitchen. She searched the pantry for something both she and Don liked to eat. When a commercial came on, he asked her what she was preparing. She said she was preparing popcorn because it was his favorite snack. (2, 4.00)

24. BOOTS

a. Susie liked the boots her parents gave her for her birthday. They were stylish as well as practical. Now she could keep her feet warm and dry in any kind of weather. Deciding to go out in the rain, she searched her apartment for what she'd need. Finally she found her new boots in the back of the bedroom closet. (9, 4.56)

b. Susie liked the gifts her parents gave her for her birthday. They were stylish as well as practical. Now she could keep her feet warm and dry in any kind of weather. Deciding to go out in the rain, she searched her apartment for what she'd need. Finally she found her new boots in the back of the bedroom closet. (9, 4.44)

c. Susie liked the boots her parents gave her for her birthday. They were stylish as well as practical. Now she could keep herself warm and dry in any kind of weather. Deciding to go out in the rain, she searched her apartment for what she'd need. Finally she found her new boots in the back of the bedroom closet. (9, 4.56)

d. Susie liked the gifts her parents gave her for her birthday. They were stylish as well as practical. Now she could keep herself warm and dry in any kind of weather. Deciding to go out in the rain, she searched her apartment for what she'd need. Finally she found her new boots in the back of the bedroom closet. (2, 4.50)

25. BONES

a. Sam needed to find some bones to prove his murder theory. He was sure the man had been murdered by the mob 2 years ago. He was nervous as he put his shovel into the ground where he thought the makeshift grave was. He soon uncovered what he was looking for. He picked up one of the bones and smiled with satisfaction. (7, 4.43)

b. Sam needed to find some evidence to prove his murder theory. He was sure the man had been murdered by the mob 2 years ago. He was nervous as he put his shovel into the ground where he thought the makeshift grave was. He soon uncovered what he was looking for. He picked up one of the bones and smiled with satisfaction.
(7, 3.57)

c. Sam needed to find some bones to prove his murder theory. He was sure the man had been kidnapped by the mob 2 years ago. He was nervous as he searched the forest for evidence of the man's strange disappearance. He soon uncovered what he was looking for. He picked up one of the bones and smiled with satisfaction.
(8, 4.50)

d. Sam needed to find some evidence to prove his murder theory. He was sure the man had been kidnapped by the mob 2 years ago. He was nervous as he searched the forest for evidence of the man's strange disappearance. He soon uncovered what he was looking for. He picked up one of the bones and smiled with satisfaction. (0, NR)

26. BABY
a. Little Ann was excited about the new baby. She was hoping for a brother. One day she was playing in her room when she heard some noises downstairs. It sounded like crying. Ann ran to see what it was. It was Daddy carrying a baby boy in his arms. (9, 4.56)

b. Little Ann was excited about the big event. She was hoping for a brother. One day she was playing in her room when she heard some noises downstairs. It sounded like crying. Ann ran to see what it was. It was Daddy carrying a baby boy in his arms. (9, 4.56)

c. Little Ann was excited about the new baby. It was going to be great. One day she was playing in her room when she heard some noises downstairs. It sounded like Daddy. Ann ran to see what it was. It was Daddy carrying a baby boy in his arms. (8, 3.88)

d. Little Ann was excited about the big event. It was going to be great. One day she was playing in her room when she heard some noises downstairs. It sounded like Daddy. Ann ran to see what it was. It was Daddy carrying a baby boy in his arms. (9, 3.50)

27. LEG

a. A doctor came in to examine Eva's leg after her accident. Eva looked down at the heavy cast, wondering whether she'd ever ski again. Her parents arrived after she had gone to sleep and asked the doctor what Eva had injured. The doctor said that Eva's leg would heal and they shouldn't worry. (9, 4.00)

b. A doctor came in to examine Eva after her accident. Eva looked down at the heavy cast, wondering whether she'd ever ski again. Her parents arrived after she had gone to sleep and asked the doctor what Eva had injured. The doctor said that Eva's leg would heal and they shouldn't worry. (8, 4.12)

c. A doctor came in to examine Eva's leg after her accident. Eva looked at all the bruises and cuts, wondering exactly what had happened. Her parents arrived after she had gone to sleep and asked the doctor what Eva had injured. The doctor said that Eva's leg would heal and they shouldn't worry. (9, 4.44)

d. A doctor came in to examine Eva after her accident. Eva looked at all the bruises and cuts, wondering exactly what had happened. Her parents arrived after she had gone to sleep and asked the doctor what Eva had injured. The doctor said that Eva's leg would heal and they shouldn't worry. (2, 3.50)

28. PAN

a. Chuck was making breakfast and he wanted the right pan for the job. He was going to fry sunny side-up eggs, bacon and homefries. He thought about the delicious meal as he searched the cabinets for what he needed. He reached in the lower cabinet and chose the pan with the non-stick surface. (6, 4.50)

b. Chuck was making breakfast and he wanted the right thing for the job. He was going to fry sunny side-up eggs, bacon and homefries. He thought about the delicious meal as he searched the cabinets for what he needed. He reached in the lower cabinet and chose the pan with the non-stick surface. (7, 3.71)

c. Chuck was making breakfast and he wanted the right pan for the job. He was going to make something different and exciting for a change. He thought about the delicious meal as he searched the cabinets for what he needed. He reached in the lower cabinet and chose the pan with the non-stick surface. (7, 3.86)

d. Chuck was making breakfast and he wanted the right thing for the job. He was going to make something different and exciting for a change. He thought about the delicious meal as he searched the cabinets for what he needed. He reached in the lower cabinet and chose the pan with the non-stick surface. (O, NR)

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